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practically under xerophytic conditions. This would tend to render the root system inefficient as a means of water absorption and make the possession of a water-storing organ like the pitchered leaf of great advantage to the plant.

The epiphyte *Nepenthes* represents the highest degree of adaptation, in that it produces a protein-dissolving enzyme, the nepenthin of Vines (Ann. Bot. **15**: 563. 1901). Even here, however, the absorption of protein by the leaves is not absolutely essential to the life of the plant, though of great advantage. *Nepenthes*, then, stands at the upper limit in the evolution of plants with pitchered leaves, while *Sarracenia purpurea* is near the lower limit. Between them are numerous forms with varying degrees of adaptation.

NEW YORK BOTANICAL GARDEN.

## SPECIES AND VARIETIES

BY T. D. A. COCKERELL

The recent discussions on the species question, particularly that of the Botanical Society, printed in the May number of the American Naturalist, show at least one thing — that the matter may be regarded from very diverse points of view. This being so evident I beg permission to add yet another to the already numerous collection.

Politically, I am an American; but biologically, an Englishman, with many of the idiosyncrasies of that singular race. According to current report, one of the peculiarities of the English is a limited sense of humor. I rather incline to the opinion that this is not wholly to their discredit; but nevertheless, I am far from proposing legislation to prohibit anyone from making a joke unintelligible to the Anglo-Saxon mind. Such restrictions have probably never been contemplated in respect to jokes, but are they not a little like those desired by botanists, who insist that all species must be discernible to general students of plants? Such persons talk about the *creation* of species by botanists, showing thereby, and in other ways, their opinion that species are purely artificial things. Their attitude toward species is something like

that of the legislators who, very properly, enacted laws about the size of the fourpenny loaf. In a certain sense of course they are perfectly right. The term species is applied to a particular kind of thing, not any more definable perhaps, than humor, but about as easily recognizable in the majority of instances. It is not permissible to call anything humor, or species, at random; but it must be recognized that these names do stand for realities, and that in either case these may be genuine enough, and yet overlooked by the majority of persons. If a species were not a real thing, a segregated object related to, but discrete from others such objects in a complex and wonderful world, all our discussion would be relatively meaningless; and those would be right who should urge that we occupy our minds with something more profitable.

While it is doubtless true that every taxonomist has good reason to complain of the conduct of all his colleagues, it seems possible, at least, that much of the lamentation which so frequently falls upon our ears is the result of mere inertia. Take the genus *Crataegus*, cited everywhere as a horrible example. In the old days, *Crataegus* was easy; the "species" were few, and had easily recognizable characters. If we could proceed without taking any account of the facts of nature the old system would have much to commend it — at least for those who prefer uniformity to variety, dullness to incident. We know to-day that American *Crataegus*, like the *Rubus* and *Hieracium* of Europe, is wonderfully polymorphic; and the study of this multitude of stars of the eighth magnitude offers as interesting and profitable work for the evolutionist as he could well desire. I have compared the species of *Crataegus* with minor stars, and the comparison is I think apt. They are separable entities, but of different grade of magnitude from ordinary species; amateur astronomers, as amateur botanists, may from preference or necessity confine their attention to the more visible units; but neither the *science* of astronomy, nor that of botany, has any right to such limitations.

As we gain knowledge, we see more and more clearly that "species" are of various grades and kinds: and it is eminently

desirable to devise a system which shall indicate this diversity. We are not yet prepared, I venture to think, to do this with complete success, but it is one of the necessities of the future ever to be kept in mind. In the meanwhile, any proposal to go back to the old system, and virtually ignore all the wonderful facts of segregation which have been revealed to us in recent years, is simply pernicious.

From the standpoint of convenience and intelligibility, it seems to me that there is much to be gained by the recognition of subspecies, with a trinomial nomenclature. The introduction of a new form as a subspecies when its precise status is uncertain, has at least the advantage of calling attention to its manifest affinities, and suggesting further work to determine the character and extent of the segregation. The proposal to deny subspecific names obligatory priority when the plants they represent are treated as separate species seems to me unfortunate, since it will assuredly have a strong tendency to cause writers to announce their novelties as full species whenever there is any possibility of their proving such, and will place more cautious workers at a disadvantage.

I cannot see much advantage in the proposal to distinguish minor forms or races by numerals. Imagine specific names replaced by numbers! Numbers are not only less interesting than names, but are more easily confused and misprinted, and when errors of this kind are made there is nothing to show what is wrong. Is it fair to hint that this botanical penitentiary-system for minor segregates is desired by those who really wish to relegate these things to comparative obscurity; whereas to some others, — *e. g.* the evolutionist and the horticulturist, they are of prime importance? The system of naming things is not peculiar to science; it is found useful to extend nomenclature as far as human interest can or will follow; thus every individual of *Homo sapiens* has a distinctive name, and if we had the sort of mind which is usually attributed to the deity, I suppose every individual plant would be esteemed worthy of a like distinction. As it is, the real question about races is, are they worth thinking about, talking about, and describing, considering our human limitations? The answer of modern biology surely is, yes!

A code system for parallel modifications seems eminently desirable, but I think it should follow the character of the modification, rather than the cause, the latter being often obscure. To designate a particular form as a "shade form," for instance, seems to me to artificially simplify matters and obscure the actual facts. With shade are usually associated increased moisture and decreased temperature; but in certain places and at certain times, the exact reverse is true. In all this, we come back to the great fact of the complexity of natural phenomena; and while we seek everywhere for general laws and find them in operation, we must not forget the Linnean motto: "Natura maxime miranda est in minimis."

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## NOTES ON THE LIFE AND WORK OF CHARLES C. FROST *

BY WILLIAM A. MURRILL

Charles Christopher Frost, the "shoemaker botanist" of Brattleboro, Vermont, by integrity and simplicity of life and singleness of purpose in his work and in his recreation amassed a modest fortune and greatly advanced the knowledge of the flora of his native state.

A plain man, of great modesty, he repeatedly declined scientific positions and honors, and stuck to his trade of shoemaking during his entire working life, occupying the same shop for a period of forty-nine years. When asked the reason for this he replied, "Whatever I have acquired of science, in my life, came through search for health and mental entertainment; science is not my profession — shoemaking is." His character was formed along strictly puritanical lines, industry, simplicity, reserve, and deep religious conviction being its prominent characteristics.

Frost's success was due to a splendid intellect and close application. He had no advantages, except those afforded by a small

* Editor's Note. — This article forms an interesting introduction to Dr. Murrill's paper on the *Boleti* of the Frost Herbarium, which is to be published in the *Bulletin*.